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ABSTRACT

Ten test films were developed to measure aspects of children's visual perception which are difficult to assess through conventional paper and pencil tests. The film medium was selected because it allows the presentation of temporal, as well as spacial, aspects of the stimuli. Four areas of perceptual performance covered in the films are: (1) visual memory span, dealing with the quantity of visual material which the child can absorb and retain over a period of time; (2) the child's use of a space structure, or use of a spatial system within which all objects can be located at once; (3) space-time translation, requiring the child to integrate and interpret visual information about various forms, presented serially in the film; and (4) form perception, or the child's identification of a form in the presence of distracting or confusing details. Establishment of test validity may prove difficult, because of various factors which are discussed. (NH)

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The Relationship of Measured Perceptual Processes to School Learning

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An attempt was made in these cinematic materials to measure aspects of visual perception in children which are very difficult to assess through conventional paper and pencil tests. The advantage of cinematography is its ability to deal not only with the spatial aspects of visual displays but with their temporal aspects as well. Many activities of normal perception involve a time element as well as a space element. Any movement of an object is identified through a continuous temporal appreciation of change. Successive fixations must be molded into an integrated whole in which the temporal differences are erased by the integration. Such aspects of perception, it would seem, could best be investigated through a medium which would permit the manipulation of both the spacial and temporal aspects of the stimulus.

Taking the factor analysis study described in the preceeding paper as a point of departure, test sequences were identified which appeared to measure the type of variable in which we were interested. Additional sequences were designed to augment these tests in areas where adequate coverage did not seem to be present. The result was ten test films covering four areas of perceptual performance.

The first area, visual memory span, deals with the quantity of visual material which the child can absorb and retain over time. The first test, Figural Memory Span presents pictures of objects which the child is asked to remember. This test is very similar to the customary test of visual attention span. In the second test, the objects are presented in succession rather than simultaneously. Again the child is asked to remember what he saw. Since

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verbalization can be used as an intervening procedure when common objects are pictured, the third test presents meaningless figures in succession. With these figures the possibility of translating to verbal symbols and hence to what is more nearly an auditory memory span is reduced.

Such accumulation of visual information seems required in many classroom tasks. Both reading and writing are tasks in which the entire activity cannot be seen (or at least attended to) simultaneously. The child is required to gather information in a series of temporal intervals, store this information and respond on the basis of the whole work, phrase or passage. Many exploratory activities essential to learning are similar. The child cannot see the inside of a box and its outside at the same time. He must gather visual information about one and, at a later time, about the other. His overall impression of the object results from storing and later combining these two visual impressions. Although the integrative aspect of these performances is not tapped in this series of tests, the gathering and storing aspects seem very similar to the tasks presented on the films.

The second area deals with the child's use of a space structure. The first test, Spatial Orientation of Objects, presents the child with cylindrical objects which move to new positions on a well defined background. The child is to indicate the changes. The second test, Driving Test, involves a toy car which moves down a street between buildings and turns in different directions. The child is to indicate the changes in direction made by the car.

Space structure refers to the use of a spatial system within which all objects can be located at once. Developmentalists have distinguished between subjective space, in which the child can locate objects in relationship to himself (ego-centric space) and the latter developing objective space in which the child can locate objects in relation to each other and locates himself within the system. This space structure is Euclidean and is an abstraction.

It permits the child to preserve the relationships between all objects within his visual environment at all times. A particular problem in such a structure is the moving object. In the event of movement, the position of the moving object relative to all other objects is constantly changing. To appreciate such movement, the child must stabilize these relativities: a task which requires the use of a space structure.

The basic concepts of arithmetic are grouping concepts. As such they are visual spatial concepts. An adequate space structure is needed if arithmetic is to be more than a series of rote memory facts. The spatial aspect has formed the basis of such teaching methods as those of Strauss, Stern and others. As far as is known, the present procedure is the first attempt to investige the movement factor within a space structure.

Related to space structure is the third area of investigation in the present studies, Space-Time Translation. This area consists of three tests: Moving Slot, in which a figure moves behind a slot so that only a portion of it can be seen at a time; Successive Figures, in which the single lines of a geometric figure are flashed one at a time; and Pathfinder, in which a moving dot describes a form. In each case, the child is required to identify the form presented. In these films, visual information is presented serially and must be integrated into a simultaneous visual display or visual image which is then interpreted.

This space-time function is involved in many everyday tasks. When you came into this room, you fixated a part of the room and gathered certain visual information. Since this fixation did not cover all the area, however, you changed your fixation to another point and gathered more information. From a series of such fixations, you constructed a simultaneous impression of the entire room, even though you have never been able to see all of it at once. You are aware of and can construct the visual information concerning the whole

through the integration of a temporal series of visual impressions.

The opposite translation is involved in the drawing or copying of a form. If the child is shown a square and asked to copy it, he must deal with the parts one at a time. Since he does not have four hands and four crayons he has to break the square figure down into parts which can be dealt with successively in time (one line at a time). In so doing, however, he must not loose the impression of the total figure for, if he does the square becomes truly "just four lines" instead of a square. Most of the tasks of our school classrooms involve translating from the temporal system to the spatial system and back again. If the two systems are not compatible, difficulty results for the child.

The final area of investigation deals with form perception. The two films, Form Identification and Embedded Figures, deal with the identification of a form in the presence of distracting or confusing details.

Form perception has been recognized as an important perceptual ability for sometime. It is significant to the recognition and identification of letters and words in the reading task and to the reproduction of materials in writing or drawing. Unless visual materials come together into coherent groups and combinations, confusion results and the processing of visual information is slowed and remains inadequate. The child continues to deal with perceptual elements instead of being able to develop the emergent qualities of integrated forms. Such emergent qualities serve both to emphasize the important aspects of the display and to permit the handling of many data simultaneously since these data are subsumed by the emergent quality. Thus when squareness is generated, it is not necessary to see four lines and four angles since these are subsumed under the quality squareness.

The considerations underlying this series of tests are logical analyses of visual perceptual processes. They have been observed clinically and appear

to be effective concepts for the guidance of therapeutic procedures. All have been current in the clinical literature for sometime. Thus Gibson discussed space structure, Strauss emphasized the space-time translation, Frostig is concerned with spatial orientation, many workers have dealt with form perception. Clinically, therefore, the concepts used here are common considerations. Their verification through rigid research techniques, however, has yet to be demonstrated.

The establishment of validity estimates for this series of tests and the underlying concepts may prove somewhat difficult. It is commonly accepted that the child with a perceptual handicap shows marked disparity in development from one perceptual function to another. It almost seems as though, having trouble making perceptual judgements, he picks a few functions which he can perform with relative ease and develops these to a very high level, attempting to substitute them for the functions with which he has difficulty. Therefore, in any one function, a child with perceptual handicaps may well score very high. With a group of tests and a group of handicapped children, therefore, the distribution of high and low scores may well be such that on any one test, no marked differences between experimental and control groups may occur. It may well be that the technique of comparing means may be too naive a procedure to reveal the true functions of the test. Comparative performances on several test or a profile of abilities and disabilities may be needed to reveal the child's perceptual performance.

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A second consideration involves the degree of ability required for performance. For example, in reading, enough form perception to permit recognition and identification of letters and words is required. The degree of refined form perception required by a gem cutter is not necessary to the reading task. If reading is the criterion measure, therefore, extremely high scores

on the test may not contribute proportionately to success on the criterion. This principle of minimum requirements suggests that some of the assumptions underlying the Pearson Product-Moment approach to validity estimates may not be satisfied. Curvilinear techniques or cut off scores may give a clearer picture.

It is probable, therefore, that validity studies with these film test must be planned with some care. Such studies should reflect the clinical aspects of perception as well as technical statistical procedures. In such tests we are dealing with methods of processing data rather then with quantitative performances alone. Such a consideration requires careful evaluation of the functions and assumptions underlying research design.